

CLAIMS

1. A method of forming particles, comprising:
accelerating a first stream comprising a first liquid; and
vibrating the first stream, to form particles.
- 5 2. The method of claim 1, further comprising solidifying the particles.
3. The method of claim 1, wherein the particles comprise a core and a shell.
4. The method of claim 3, wherein the particles comprise a plurality of shells.
- 10 5. The method of claim 1, wherein the particles comprise a pharmaceutical composition.
6. The method of claim 3, wherein the core comprises a pharmaceutical composition.
7. The method of claim 1, wherein the accelerating comprises contacting the first stream with a second stream, and
15 the second stream comprises a second liquid.
8. The method of claim 7, wherein the second stream surrounds the first stream.
9. The method of claim 1, wherein the accelerating comprises applying charge to the first stream.
- 20 10. The method of claim 9, wherein
a second stream comprising a second liquid surrounding the first stream, and
the accelerating further comprises accelerating the second stream.

11. The method of claim 10, wherein the particles comprise a core and a shell.
12. The method of claim 11, wherein the particles comprise a plurality of shells.
- 5 13. The method of claim 1, further comprising forming the first stream by passing the first liquid through a nozzle.
14. The method of claim 10, wherein the nozzle has a diameter greater than 1/2 an average diameter of the particles.
- 10 15. The method of claim 11, wherein the nozzle has a diameter at least the average diameter of the particles.
16. The method of claim 1, wherein the particles have an average diameter of at most 100 μm .
17. The method of claim 1, wherein the particles have an average diameter of at most 50 μm .
- 15 18. The method of claim 17, wherein the particles have an average diameter of 10 nm to 50 μm .
19. The method of claim 17, wherein the particles have an average diameter of 1 μm to 50 μm .
- 20 20. The method of claim 1, wherein the particles have an average diameter of 50 to 100 μm , and 90% of the particles have a diameter that is within 2% of an average diameter of the particles.
21. The method of claim 1, wherein the particles have an average diameter of 1 to 50 μm , and 90% of the particles have a diameter that is within 1 μm of an average diameter of the particles.

22. The method of claim 1, wherein
the accelerating is a step for accelerating the first stream, and
the vibrating is a step for vibrating the first stream.
23. A method of forming particles, comprising:
accelerating a first stream comprising a first liquid;
wherein the accelerating comprises applying charge to the first
stream, and
the particles comprise a core and a shell.
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24. The method of claim 23, further comprising solidifying the
particles.
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25. The method of claim 23, wherein the particles comprise a plurality
of shells.
26. The method of claim 23, wherein the particles comprise a
pharmaceutical composition.
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27. The method of claim 23, further comprising forming the first stream
by passing the first liquid through a nozzle, and
wherein the nozzle has a diameter at least 1/2 the average diameter
of the particles.
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28. The method of claim 23, wherein the particles have an average
diameter of at most 100 μm .
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29. The method of claim 23, wherein the particles have an average
diameter of 10 nm to 50 μm .
30. Particles having an average diameter of 50 to 100 μm , wherein 90%
of the particles have a diameter that is within 2% of an average diameter of the
particles.

31. The particles of claim 30, wherein 95% of the particles have a diameter that is within 1% of an average diameter of the particles.

32. Particles having an average diameter of 1 to 50 μm , wherein 90% of the particles have a diameter that is within 1 μm of an average diameter of the particles.

5 33. The particles of claim 32, wherein the particles have an average diameter of 1 μm to 30 μm .

34. The particles of claim 33, wherein the particles have an average diameter of 1 μm to 10 μm .

10 35. The particles of claim 30, wherein the particles comprise a core and a shell.

36. The particles of claim 35, wherein the particles comprise a plurality of shells.

15 37. The particles of claim 30, wherein the particles comprise a pharmaceutical composition.

38. The particles of claim 35, wherein the core comprises a pharmaceutical composition.

39. Particles, prepared by the method of claim 20.

40. Particles, prepared by the method of claim 21.

20 41. An apparatus for forming particles, comprising:
(i) a first nozzle, for forming a first stream of a first liquid,
(ii) a second nozzle, oriented for forming a second stream of a second liquid in contact with the first stream, and
(iii) a vibrator, for forming particles from the first stream.

42. The apparatus of claim 41, wherein the second nozzle is coaxial with the first nozzle.

43. The apparatus of claim 41, wherein the vibrator comprises a piezoelectric transducer.

5 44. The apparatus of claim 41, wherein the first nozzle has a diameter of at least 30 µm.

45. The apparatus of claim 41, wherein the first nozzle has a diameter of at least 100 µm.

46. An apparatus for forming particles, comprising:

10 (i) a first nozzle, for forming a first stream of a first liquid,
(ii) a charge source, for applying charge to the first stream, and
(iii) a vibrator, for forming particles from the first stream.

47. The apparatus of claim 46, wherein the charge source comprises a rectifier and a transformer.

15 48. The apparatus of claim 46, wherein the vibrator comprises a piezoelectric transducer.

49. The apparatus of claim 46, wherein the first nozzle has a diameter of at least 30 µm.

20 50. The apparatus of claim 46, wherein the first nozzle has a diameter of at least 100 µm.

51. The apparatus of claim 46, further comprising (iv) a second nozzle surrounding the first nozzle, for forming a second stream of a second liquid surrounding the first stream.

52. An apparatus for forming particles, comprising:

25 (i) means for forming a first stream of a first liquid,

- (ii) means for accelerating the first stream, and
- (iii) means for vibrating the first stream.

53. The apparatus of claim 52, wherein the means for accelerating the first stream is a second nozzle.

5 54. The apparatus of claim 52, wherein the means for accelerating the first stream is a charge source.

10 55. An apparatus for forming particles, comprising:

- (i) a first nozzle, for forming a first stream of a first liquid,
- (ii) a second nozzle surrounding the first nozzle, for forming a second stream of a second liquid surrounding the first stream,
- (iii) a charge source, for applying charge to at least one of the first and second streams.

56. The apparatus of claim 55, wherein the charge source comprises a rectifier and a transformer.

15 57. The apparatus of claim 55, wherein the first nozzle has a diameter of at least 30 µm.

58. The apparatus of claim 55, wherein the first nozzle has a diameter of at least 100 µm.

20 59. A method of making particles, comprising forming particles with the apparatus of claim 41.

60. A method of making particles, comprising forming particles with the apparatus of claim 46.

61. A method of making particles, comprising forming particles with the apparatus of claim 52.

62. A method of making particles, comprising forming particles with the apparatus of claim 55.